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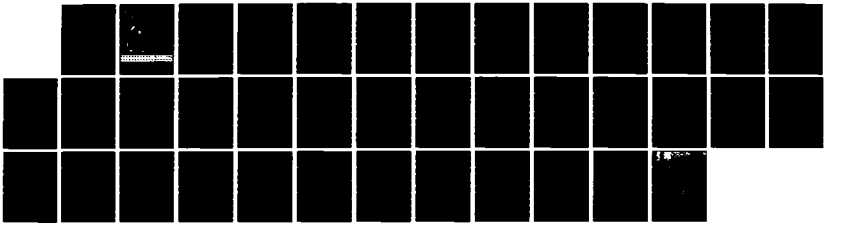

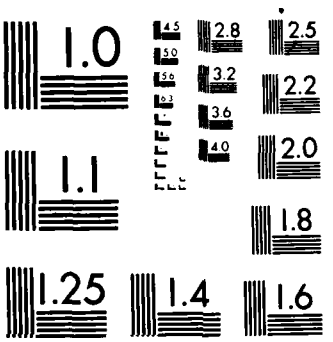

OPNAV P16-2-83
RESEARCH REPORT NO. 42

LABOR MARKET AVAILABILITY FOR U.S. NAVY CIVILIAN PROFESSIONALS IN THE 1980's

BY
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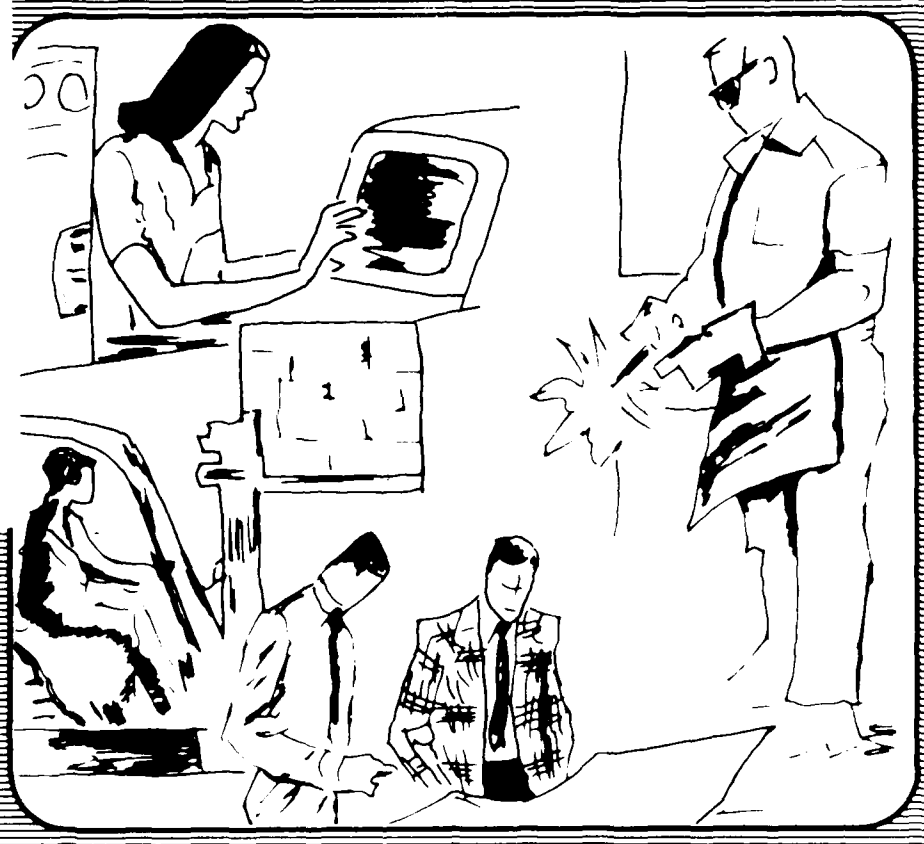

DEPARTMENT OF THE NAVY
OFFICE OF CHIEF OF NAVAL OPERATIONS (OP-16H)
WASHINGTON, D.C. 20350

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A132228	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Labor Market Availability for U.S. Navy Civilian Professionals in the 1980's		5. TYPE OF REPORT & PERIOD COVERED Technical Report January 1983
		6. PERFORMING ORG. REPORT NUMBER CNO(OP-16H) NO.42
7. AUTHOR(s) D. M. Atwater R. J. Niehaus E. S. Bres III J. A. Sheridan		8. CONTRACT OR GRANT NUMBER(s) ONR N00014-80-C-0670
9. PERFORMING ORGANIZATION NAME AND ADDRESS Office of Chief of Naval Operations (OP-16H) Washington, DC 20350		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Chief of Naval Operations (OP-16H) Washington, DC 20350		12. REPORT DATE January 1983
		13. NUMBER OF PAGES 32
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release and sale; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Labor Market Availability
Civilian Professionals
Reservation Wage Models
Equal Employment Opportunity

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This paper focuses on estimating the external labor market availabilities of professionals for U.S. Navy civilian jobs. An 1980 census update is provided for fourteen occupational areas. A combination of inputs are used including the 1980 Census EEO Special File, 1972-1980 Current Population Surveys (CPS's), and internal Navy data. Projections through use of a reservation wage model are provided for 1988 and 1990.

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S/N 0102-014-6601

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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January 1983

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Department of The Navy
Office of Chief of Naval Operations (OP-16H)
Washington, D.C. 20350

FORWARD

Research Report No. 42, OPNAV P16-2-83 was prepared as part of the activities of the Assistant for Human Resources Analysis (OP-16H). The objective of the project discussed in this report was to develop labor market availability data for U. S. Navy civilians in the 1980's.

This report is approved for public release.

ROBERT K. LEHTO
Director, Total Force
Information Systems Management Division

Introduction

In virtually all projects designed to estimate employer human resource staffing both labor supply and demand dimensions are considered. The Department of Navy has had a continuing effort to perform such estimates. One of the primary questions being addressed by the U.S. Navy is how best to integrate a quantitative labor supply model with a quantitative labor demand model within a working management system. At the present time a linkage has been set and the integrated approach is reaching the required maturity to make estimates for the 1980's using the 1980 Census and other data sources. This paper focuses on estimating the external labor market availabilities of professionals for Navy jobs.

The Navy's original work on estimating external labor supplies was oriented towards equal employment opportunity planning (Atwater, Niehaus and Sheridan (1980) (1981)). These availability estimates using a reservation wage model were built into the Department of Navy EEO Accountability System (DONEAS) (Niehaus and Nitterhouse (1980)). The methodology was extended to include the issues of technological changes in a integrated supply-demand context (Atwater, Bres, Niehaus and Sheridan (1982)).

The study reported in this paper builds on the past efforts to continue to put into place a comprehensive human resources analytical support capability for both the policy and operational levels of the Navy. This report is concerned with the technical issues of estimating external labor market availabilities. Policy issues such as the use of the data in an affirmative action system are treated elsewhere.[1]

The report will proceed with a discussion of the preliminary studies used to define the specifications for the 1980 Census update. A review will be given of the parameters used in the current external supply study followed by the results. The report will close with a review of planned future work.

Preliminary Studies

A number of studies were conducted in the 1980-81 period

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[1]For current Department of Navy policy concerning EEO and affirmative action reporting see the relevant Secretary of the Navy Instructions (SECNAVINST 12713.12 and SECNAVINST 12713.13)

which were used to develop the specifications for the 1980 Census update of the Navy's external labor market supply data. Included were (1) determination of parameters of national and regional occupation EEO supply ratio data, (2) estimation of the impact of technological and economic change on the Navy's requirements for engineering and science technicians, and (3) study of the relevant labor force characteristics for the General Accounting Office (GAO) Evaluator occupation. Considerable insight into the needed level of occupational specificity was also obtained during the first full scale implementation of DONEAS at all levels within The Department of the Navy.

In the first set of EEO labor market supply ratio estimates (Atwater, Niehaus, Sheridan (1980)), broad occupational aggregations were used. For example the national occupations were defined as Scientists and Engineers (All Levels), Other Professional (All Levels) and Managers and Administrators (GS 13-15 and Senior Executive Service (SES). Strong concerns were expressed by both the EEO and personnel communities for more specificity. These concerns were translated into a research study to determine the limits to increasing specificity. Among the considerations in making such determinations were such questions as (1) How much specific can one get without affecting the statistical reliability of the results? (2) What level of detail is permitted by the coding taxonomies of the various data files which must be brought together? (3) At what point will effective management be overtaken by data overload? and (4) Will increased specificity change the management decisions and probable outcomes?[2]

Two studies were accomplished to determine the boundaries for the occupational aggregations to be used by the Navy. The first involved those occupations for which the nation as a whole is considered the recruitment area. The second examined the extent to which regional labor markets existed for lower level managerial and higher level technician and white collar occupations.

In the national occupation study the Office of Personnel Management occupation series codes were examined in relationship to the Department of Navy Occupation-Level (DONOL) Codes, and the three digit U.S. Census Occupation Codes. The least common denominator was the U.S. Census occupation codes. The conclusion

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[2]See Aiken, Murphy, Nelson, and Niehaus (1981) for a discussion of The Department of Navy approach of using a nested set of cross-comparisons to minimize data overload and still provide the needed detail.

of the analysis was to use functional groups equivalent to the skill group DONOL Codes (e.g., Scientists, Engineers, Mathematicians, Accountants, etc.,). Also three grade groups (i.e., GS 5-8, GS 9-12, and GS 13-15) were used. From the results of this preliminary study it was concluded that the Current Population Survey (CPS) data used should be validated against a larger 1980 Census sample before general distribution was made. As will be discussed in the results section of this report, the necessary validations have been accomplished with the availability data provided in Appendix B.

The Tidewater Virginia and Southern California regions were used in the regional study. Included were the following occupational aggregations and grade groups:

General Schedule (GS 5-8, GS 9-12)
Financial Management
Personnel Management
Miscellaneous Managers
Science and Engineering Technicians
Medical Technicians
Other Technicians

Craftsmen, Mechanics & Operatives (Journeymen)

It was found that the recruitment areas for occupations which might be characterized as regional (e.g., mid-level adminstrative and blue collar journeymen) do not extend much beyond those for lower level local occupations (e.g., clerical and semi-skilled blue collar). In the two cases studied, the recruitment areas extended about 20-25 miles from the concentrations of naval shore installations. Consequently, separate regional areas between local and national areas are not necessary. However, further study as to the recruitment areas for professional and higher level administrative occupations may be worthwhile.[3] The Navy's local labor market supply projections will use these findings. This local data will be published in a subsequent technical report.

A study was conducted to estimate the impact of technological change on the Navy's requirements for science and engineering technicians (See Atwater, Bres, Niehaus and Sheridan (1982)). A driving factor of this study was to force the development of integrated supply-demand models. The external labor

[3]See Gastwirth and Haber (1976) and Haber (1978) for further discussion on the issues of the geographic mobility of workers.

market data was used in several scenarios to predict changes in loss rates for different wage levels. Recruiting requirements were then projected using standard goal programming models.[4] The issue of the impact of external demographics on the naval shore establishment is particularly important with the expansion of the defense sector of the United States. Also such data are useful for estimating skill availabilities for mobilization planning purposes. This preliminary study proved that such prescriptive decision support systems can be constructed and used in both the technical and management senses.

Inter-agency assistance was provided to the General Accounting Office (GAO) to find a method for determining the relevant labor force characteristics of the GAO Evaluator occupation. This is the main-line occupation in GAO covering most of the professional employees of the agency. At the entry level much of the input comes from a variety of business related disciplines. At the upper levels, almost all of the input is from the internal GAO labor market. A three pronged study was completed to develop a method for obtaining the percentage weights to be used to match the GAO requirements to external public data files. Included were examinations of: (1) occupational and educational profiles of the current workforce (2) educational profiles of recent hires and (3) occupational mix preferences of GAO managers for future employees.

Relevant labor force data were computed for a variety of occupational mixes using the 1972-1980 Current Population Surveys and GAO internal data. Included in these reservation wage model studies were sensitivity checks to see how the EEO external labor supply ratios change in relationship to different occupational weighting factors. As shown in Figure 1, these weights are important if desired management mixes are to be reflected in the relevant labor force data. The internal occupational studies are continuing at GAO to better match the skills of new entrants with anticipated workload requirements in the 1980's. From a methodological perspective the GAO study provided an information tool to examine work force profile alternatives for a particular organization using standardized sets of relevant labor force statistics.

An immediate outcome of these preliminary studies was the construction of a revised set of Department of Navy Occupation Level (DONOL) Codes. Along with these studies experience gained in the analysis of occupational data from the first full-scale

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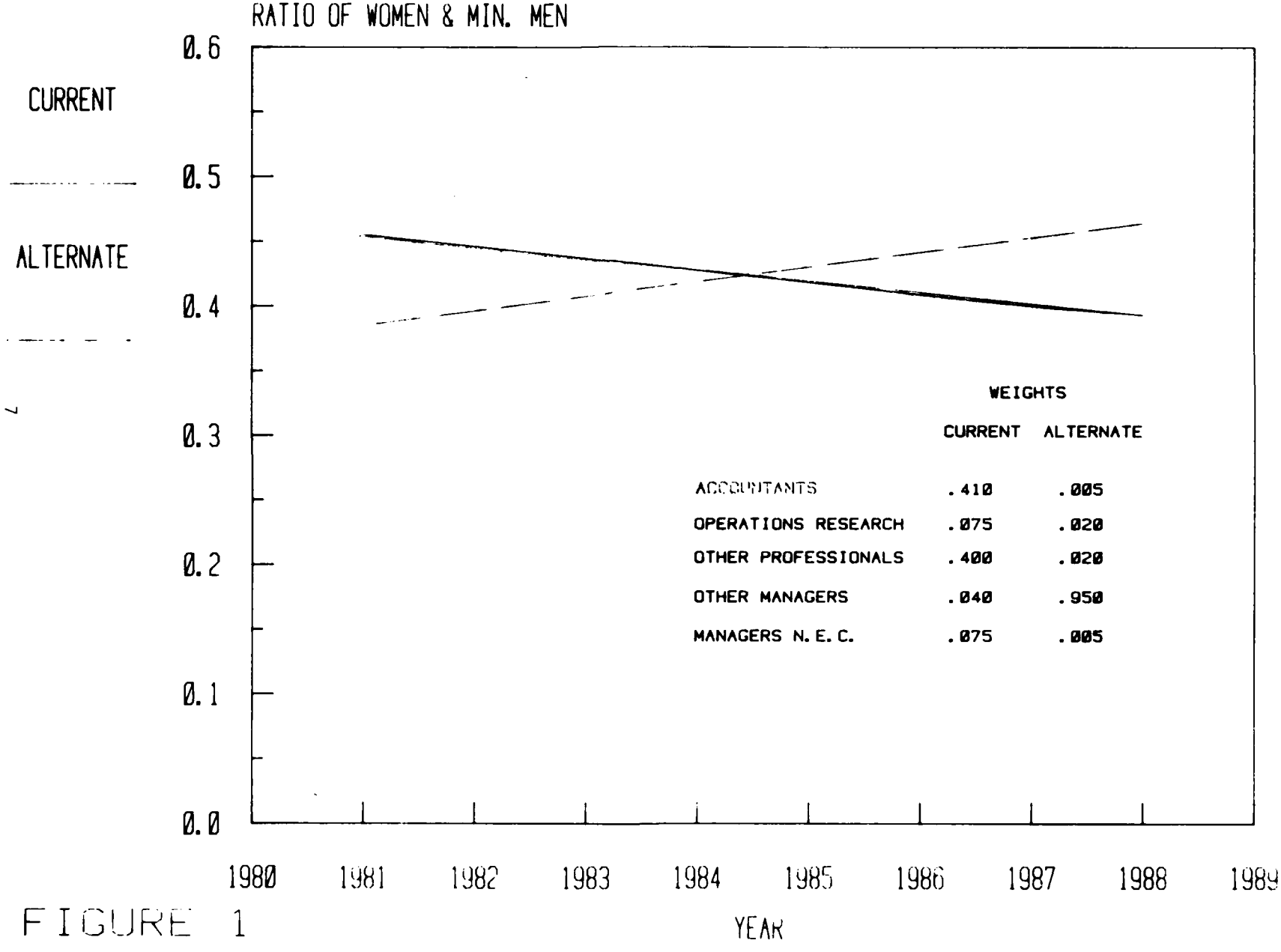
[4]For a description of the goal programming models see Charnes, Cooper, Niehaus (1972), Niehaus (1979).

operational use of the Department of Navy EEO Accountability System (DONEAS) was used in constructing the revised DONOL Codes. Also, as with any endeavor of this kind, all major user groups were consulted prior to finalization of the codes to be published as a Navy directive. Since the DONOL Codes are embedded in several Department-wide information systems, all internal independantly developed studies will automatically be consistent with the more comprehensive supply-demand studies as they are developed.

EFFECTS OF OCCUPATIONAL WEIGHTS

EEO EXTERNAL SUPPLY RATIOS FOR GS-7



	WEIGHTS	
	CURRENT	ALTERNATE
ACCOUNTANTS	.410	.005
OPERATIONS RESEARCH	.075	.020
OTHER PROFESSIONALS	.400	.020
OTHER MANAGERS	.040	.950
MANAGERS N. E. C.	.075	.005

FIGURE 1

National Numbers (NATNUM) Model

The purpose of the National Numbers (NATNUM) model is to produce relevant labor force data (RLF) data for the 1982-1990 period. The original versions of the Navy reservation wage model (See Atwater, Niehaus, Sheridan (1978) (1980)) developed availability supply ratios for EEO purposes.[5] The current version of the model produces projected supply numbers including race of national orgin and sex (RNS) breakdowns. These data are developed at a greater level of detail so that higher level (aggregates) are easily calculable. Thus, when the mix of national job groups differ in Navy installations in local areas, it is possible to develop an aligned (weighted) EEO supply ratios file which is of relevance to local facilities managers. Also, studies which are related to requirements planning can be better tailored to the issues in question.

The NATUM model uses the reservation wage methodology. The accuracy of analysis based on the reservation wage principle requires only that persons act as though they consciously calculate expected wage offers and the value of their leisure time. The statistical procedure used is a refined version of regression analysis. It begins with the public data files excluding no potential workers. The first regression analysis component uses education, experience, and existing wage data to estimate market wage offers for a specific occupation/job. These results in turn are combined with additional data on household characteristics including the numbers of children, age, race and education, in order to estimate each person's value of leisure time. A person is said to be available or in the relevant labor pool for a job if their expected or reservation wage is within the bounds of the occupation being analyzed.

In the NATNUM model the leisure and wage values are compared with Navy occupation and job data to estimate the value of time for the relevant labor markets by race or national origin and sex (RNS) groups. These data are multiplied by Bureau of Census population weights to obtain the number of potential workers available for a specific job category.

Other pertinent data such as increased college enrollments of minorities and women are also factored into the calculations of future relevant labor force standards. For example, because

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[5] The original AVPOOL reservation model was developed for AT&T. See Atwater and Sheridan (1980) and Chapter 4 of Niehaus (1979).

engineering school graduates are becoming measuringly represented among women and minorities, larger proportions are factored into the projected 1988 and 1990 results. Also, specific attention is directed towards the inclusion of an experience factor into the NATNUM calculations. The tables in Appendix A are used so that the experience factors would be as close as possible to the minimum Office of Personnel Management standards.

The NATNUM model requires specific definitions of Department of the Navy civilian personnel jobs and people characteristics. These definitions are needed to accurately assess the relative attractiveness of Navy Civilian jobs bases on economic (labor force participation) decision making criteria using public Census Bureau data files. People characteristics are needed to structure the results for EEO purposes. The NATNUM model results provided in Appendix B use the following job definitions and people characteristics:

1. Geographic Area: National (United States).

2. 1980 Current Dollar Annual Wage Bands:

   o General Schedule 5-8 ($11,240-$20,050)
   o General Schedule 9-12 ($17,300-32,100)
   o General Schedule 13-15 ($29,350-$50,10_)

3. Occupations: Fourteen (14). See Table 1 for groupings and 1970 and 1980 Census Code grouping used.

4. Work Experience/Education: Minimum experience requirements as provided in Appendix A.

5. People characteristics (Census files)

   a. Sex: Male, Female

   b. Race/National Origin: White, Black, Hispanic, Other (Asisan/Pacific Islander and Native American).

6. Work Experience/Education:

   a. Continuing years of work experience with no change in specified areas occupations in the last five years.

   b. Years of education completed without change in specified Census occupation area in the last five years.

7. Wages: Included declared self employment income as well as wages and salaries.

The NATNUM modeling process follows the operational sequence shown here:

1. Current Population Survey Cross Sectional Time Series (CSTS) files were prepared for nine years, 1972-1980. The Navy civilian personnel occupation designations were used to randomly select appropriate public file records to estimate the specified regression equation parameters. Samples were checked for small number problems which random selection (3000 records/year) might not preclude. No sampling problems were found. The data files of individual observations were structured for use in estimating the RLF participation models.

2. The NATNUM participation modeling parameters were estimated. The desired sequence was applied to yield separate parameters for males and females. The key equations and calculations included:

   a. Reduced-form participation (PROBIT) equation

   b. Moment matrix generation (for wage equation)

   c. Market wage equation (including sampling selectivity bias modifier)

   d. Structural participation (PROBIT) equation

   e. Reservation wage distribution calculations

3. Projections of RLF results were produced in two formats. Where an individual RNS group had sufficient (non-zero) RLF observations for the 1972-80 period an individual (stratified) regression was run. Where a suitable number of observations were not available the RNS/occupation observations were pooled (CSTS) for a RNS group. In all cases the same equation specification was used/for all projection regressions. Time trend factors, cyclical factors and economic variables were specified.

4. The 1980 Census EEO Special File which provides needed occupation data at local levels was obtained from the Bureau of the Census. All calculations were subjected to a parallel sort and an adjustment process completed. Comparable occupation counts (1980 Census EEO Special File/CPS-RLF estimates) were examined for each RNS group without regard to wage bands. Adjustment were spread to wage banded results based on the CPS/1980 profiles.

NATIONAL OCCUPATION CODE DEFINITIONS

DON OCCUPATION CODE*	TITLE	1980 CENSUS OCCUPATION CODES	1970 CENSUS OCCUPATION CODES
22	Scientist	069-83 (Teachers: 113-117)	042-054 (Teachers: 103-110)
23	Engineer	043, 044-059 (Teachers: 127)	002, 006-023 (Teachers: 111)
24	Mathematician	65-68 (Teachers: 128, 129)	034-036, 055 (Teachers: 112)
30	Accountant	023	001
32	Legal	178, 179	030, 031
33	Education	136, 138, 139, 145-153, 154 (Specific Subjects: 114-134, 143, 144)	134-140 (Specific Subjects: 103-114, 116-122, 126, 130)
35	Physician	084	065
36	Nurses	095	075
37	Health Professionals	085,087-089, 096-106	062-064, 071-073, 074, 076
34	Misc. Professionals	166-173, 164-165, 174-177, 163 (Soc. Sci. Teachers: 118-136)	091-096, 032-033, 086-090, 100-101, 174 (Soc. Sci. Teachers: 114, 116-122)
40	Financial Mgt.	007, 024-025	201,202
41	Personnel Mgt.	008,027	056
45	Computer Spec.	064, 229	003-005
42-44, 46-49	Mics. Mgr, & Admin.	003-006, 009-019, 026, 028-037	205, 225, 215, 183, 194, 192, 181, 184, 193, 224, 235, 240, 210, 213, 216, 245, 174, 212, 246, 211

TABLE 1

*As revised 19 OCT 1982

1980 Census Results

Upon receipt of the 1980 Census EEO Special File, a comparative analysis was made to surface any differences from the 1980 Current Population Survey (CPS). The EEO file represents a complete count while the CPS file represents estimates using weighted sample data. Tables 2 and 3 provide the comparisons in Table 2 which shows totals data for the 14 Navy occupations, the overall ratio between the CPS and EEO files is 0.88. Table 3 provides similar data by RNS group for five selected occupations. In most cases there is reasonably high correspondence between the two files. This supports the use of the CPS files to develop historical trend data across different occupations using the EEO file as the control for the projections.

An example of the total relevant labor pool data by occupation for black males is shown in Table 4. It is reemphasized at this point that the occupation definitions were developed specifically for Navy jobs. For example, the Scientist category is heavily weighted towards physical scientists which make up the bulk of the Navy jobs in this category. Use of the data would be inappropriate for organizations with a perponderance of biological scientists in this category. In Table 4 it can be seen that in the professional and administrative area, that in 1980 the greatest availabity of black males was in the miscellaneous manager category.

COMPARABILITY OF BASE POPULATIONS REPORT

OCCUPATION GROUPS	# IN CPS 1980	# IN EEO 1980	RATIO OF CPS/EEO
(1) SCIENTISTS	304318	340747	0.89
(2) ENGINEERS	1316675	1519656	0.87
(3) MATHEMATICIANS	196109	147051	1.33
(4) ACCOUNTANTS	908601	1012857	0.90
(5) LAWYERS	409868	529679	0.77
(6) EDUCATORS	273944	608764	0.45
(7) PHYSICIANS	325199	433255	0.75
(8) NURSES	1206972	1285299	0.93
(9) HEALTH PROFESSIONALS	468097	616493	0.76
(10) MISC. PROFESSIONALS	1403271	1512695	0.93
(11) FINANCIAL MANAGERS	520056	834392	0.62
(12) PERSONNEL MANAGERS	374515	642764	0.58
(13) COMPUTER SPECIALISTS	488148	520324	0.94
(14) MISC. MANAGERS	6974392	7314659	0.95
TOTAL	15103654	17198125	0.88

TABLE 2

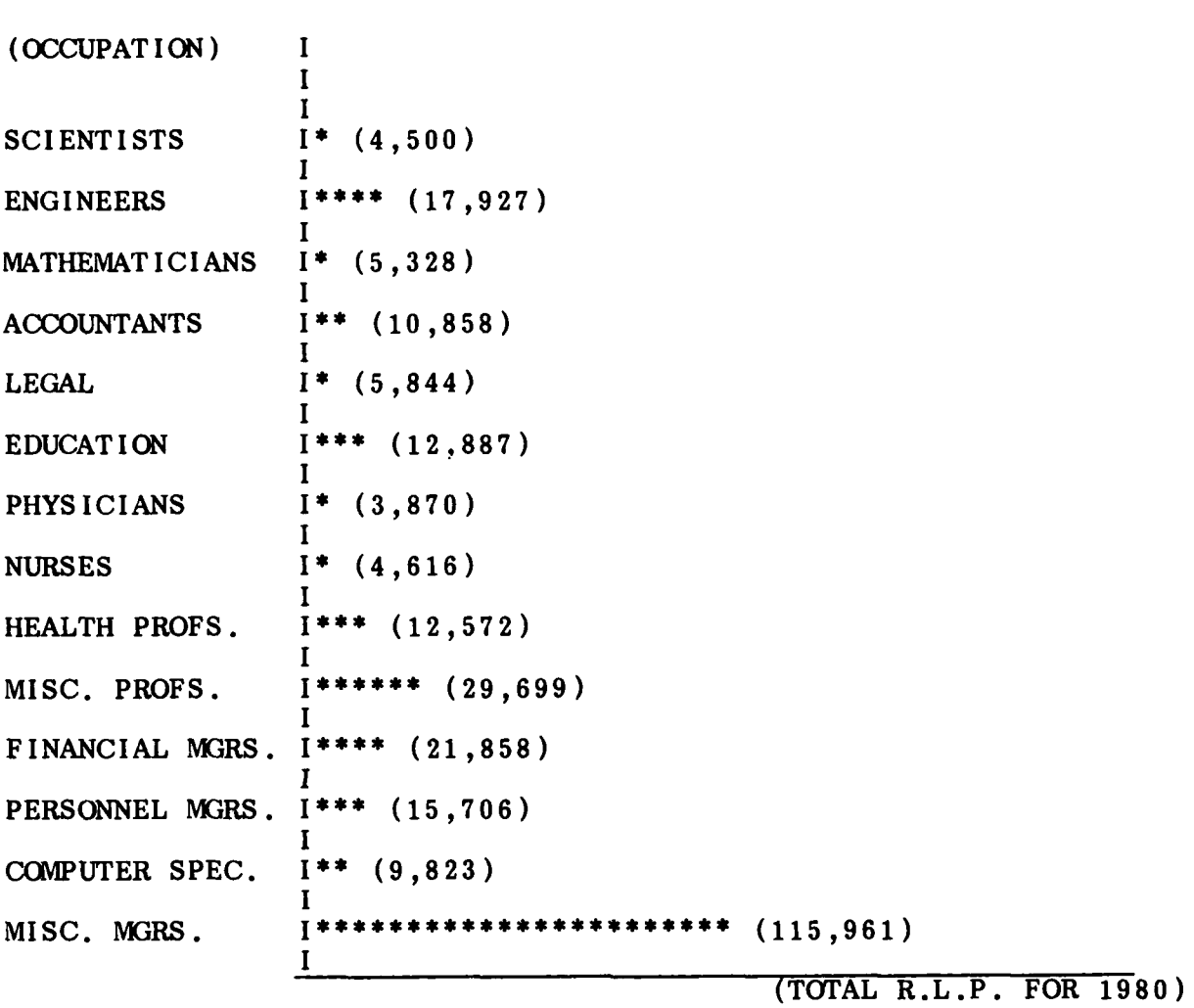
COMPARABILITY OF 1980 SEX/NATIONAL ORIGIN REPORT

OCCUPATION GROUPS	RACE/SEX GROUPS	E.E.O. TOTAL	C.P.S. TOTAL	RATIO CPS/EEO
(2) ENGINEERS	W.M.	1307672	1161356	0.888
	B.M.	34045	34617	1.107
	H.M.	34018	19527	0.574
	O.M.	68891	49486	0.718
	W.F.	64192	44834	0.698
	B.F.	4848	3373	0.696
	H.F.	2542	1137	0.447
	O.F.	3448	2345	0.680
(7) PHYSICIANS	W.M.	317142	235952	0.744
	B.M.	10090	11484	1.138
	H.M.	16283	7668	0.471
	O.M.	31774	16447	0.518
	W.F.	40700	36996	0.909
	B.F.	3153	7897	2.505
	H.F.	2570	674	0.262
	O.F.	11543	8081	0.700
(12) PERSONNEL MANAGERS	W.M.	313145	171754	0.548
	B.M.	28128	8521	0.303
	H.M.	17147	7920	0.462
	O.M.	6366	326	0.051
	W.F.	226458	146173	0.645
	B.F.	32150	25526	0.794
	H.F.	13409	11685	0.871
	O.F.	5961	2610	0.438
(13) COMPUTER SPECIALISTS	W.M.	334573	309618	0.925
	B.M.	15889	11224	0.706
	H.M.	9720	7904	0.813
	O.M.	15674	5272	0.336
	W.F.	121513	136071	1.120
	B.F.	11261	11175	0.992
	H.F.	3842	925	0.241
	O.F.	7852	5959	0.759
(14) MISC. MANAGERS	W.M.	4831965	4839236	1.002
	B.M.	199116	141759	0.712
	H.M.	159591	161417	1.011
	O.M.	95345	68023	0.713
	W.F.	1781601	1622442	0.911
	B.F.	141957	68685	0.484
	H.F.	66259	57515	0.868
	O.F.	38825	15315	0.394

TABLE 3

TOTAL RELEVANT LABOR POOL
BY OCCUPATION

BLACK MALES



(*=5000)

TABLE 4

The data in Table 5 shows an example of the analysis conducted to determine the percentages of the relevent external labor market which correspond to the Navy's wage bands. The data was developed by wage bands within occupations within RNS groups. For example of the 64,192 white females indentified as engineers or the EEO file, 43.3% fall within the GS 5-8 wage band.[6] The concentration of white females in the lower band would indicate the availability of recent college graduates. On the other hand, over 30% of white female engineers are earning salaries outside the Federal pay scale. It can be hypothesized that most of this 30% earn a salary greater than $50,112 which was the cap on Federal salaries at the time.

Tables 6 and 7 and Appendix B show the projected dynamics of the changes between 1972 and 1990. Table 6 shows the relative changes by RNS group for the mid level or GS 9-12 wage band for selected occupations. A year-by-year comparison for the historical and projected availability of white males for the same occupations is shown on Table 7. Appendix B shows for the 14 Navy National occupations by RNS group the actual availability percentages for 1980 and the projected availability percentages for 1982, 1988, and 1990.

A comparison as shown on Table 8 was made between availability data published in 1980 (Atwater, Niehaus, and Sheridan (1980)) and the present study. These data represent the aggregation of the scientist, engineer, and mathematician occupations weighted according to the approximate Navy requirements in those occupations. Several things are different between the two studies. First, in the current study, mathematics and science teachers were included while they were left out of the earlier study. The CPS data used earlier was drawn from the continental United States whereas all 50 states and territories of the U.S. are included in the 1980 EEO file. Finally, the econometric models have been improved through use in a number of studies since 1980. The more recent data (labeled 1983 study on Table 8) indicate greater numbers of white females available to the Navy at the entry levels. However, at the higher wage bands, the latest projections indicate a larger number of males than previously displayed. This is particularly true for black and hispanic male engineers.

The various sets of results in this report indicate substantial positive progress for minorities of both sexes which should continue is the 1980's. The data for white females is mixed. In

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[6] It should be noted that the special federal pay table for engineers was used for the analysis. For example, in 1980, the upper bound of the GS 5-8 pay bond for engineers was

some cases the projected absolute change for a given RNS group may be greater than before but the percentage availability is less This is due to the growth of the occupation as a whole coupled with the continued entry of white males in those occupations. However, on the whole, it appears that upward mobility is more a function of entry into a given occupation than any other factor.

WAGE BAND DECOMPOSITION REPORT

	NAVY OCCUPATION GROUP	TOTAL # IN EEO	% G.S. 5-8 TO EEO	% G.S. 9-12 TO EEO	% G.S. 13-15 TO EEO
WHITE FEMALES	ENGINEERS	64192	43.3	19.4	4.7
	PHYSICIANS	40700	*	25.1	18.6
	PERSONNEL MGRS.	226458	17.7	15.9	6.3
	COMPUTER SPEC.	121513	23.8	44.1	12.3
	MISC. MGRS.	1781601	32.1	18.0	3.3

	NAVY OCCUPATION GROUP	TOTAL # IN EEO	% G.S 5-8 TO EEO	% G.S. 9-12 TO EEO	% G.S. 13-15 TO EEO
BLACK FEMALES	ENGINEERS	4848	31.0	66.0	2.7
	PHYSICIANS	3153	*	3.2	56.6
	PERSONNEL MGRS.	32150	24.2	22.2	7.5
	COMPUTER SPEC.	11261	13.3	74.2	5.1
	MISC. MGRS.	141957	33.6	29.3	1.9

	NAVY OCCUPATION GROUP	TOTAL # IN EEO	% G.S 5-8 TO EEO	% G.S. 9-12 TO EEO	% G.S. 13-15 TO EEO
HISPANIC FEMALES	ENGINEERS	2542	22.3	8.8	8.8
	PHYSICIANS	2570	*	9.9	89.1
	PERSONNEL MGRS.	13409	45.8	49.2	5.0
	COMPUTER SPEC.	3842	78.7	10.7	10.8
	MISC. MGRS.	66825	30.2	9.8	3.5

* NOTE: THERE ARE NO PHYSICIANS IN G.S. 5-8.

TABLE 5

DYNAMICS OF REPRESENTATION CHANGE
RLP REPORT

NAVY OCCUPATION GROUPS	RACE/SEX GROUPS	1972 RLP*	% IN 1972	1990 RLP*	% IN 1990
(2) ENGINEERS	WM	180371	91.5	555237	82.8
	BM	4491	2.3	36648	5.5
	HM	0	0.0	18488	2.8
	OM	10929	5.5	33672	5.0
	WF	1282	0.7	18569	2.8
	BF	0	0.0	5142	0.7
	HM	0	0.0	557	0.1
	OF	0	0.0	3046	0.3
(7) PHYSICIANS	WM	25217	54.7	39446	55.8
	BM	0	0.0	1922	2.7
	HM	1459	3.1	4155	5.9
	OM	4963	10.8	9325	13.2
	WF	13010	28.2	10519	14.9
	BF	0	0.0	250	0.3
	HM	0	0.0	655	0.9
	OF	1473	3.2	4478	6.3
(12) PERSONNEL MGRS.	WM	29832	70.9	164046	63.8
	BM	2430	5.8	6726	2.6
	HM	0	0.0	8456	3.3
	OM	0	0.0	6237	2.4
	WF	9836	23.3	47171	18.4
	BF	0	0.0	11442	4.4
	HM	0	0.0	8205	3.2
	OF	0	0.0	4866	1.9
(13) COMPUTER SPEC.	WM	105024	80.7	297416	75.3
	BM	1322	1.0	6203	1.6
	HM	0	0.0	12444	3.1
	OM	0	0.0	3770	0.9
	WF	22330	17.2	57394	14.5
	BF	1456	1.1	13417	3.4
	HM	0	0.0	1027	0.3
	OF	0	0.0	3344	0.9
(14) MISC. MGRS.	WM	1437930	85.1	2806539	79.3
	BM	42156	2.5	84226	2.4
	HM	19254	1.1	53042	1.5
	OM	8692	0.5	22930	0.6
	WF	166746	9.9	472751	13.4
	BF	11509	0.7	66827	1.9
	HM	1487	0.1	12086	0.3
	OF	114	0.1	21154	0.6

* G.S LEVEL 9-12 ONLY

TABLE 6

DYNAMICS OF CHANGE IN WAGE BAND BREAKDOWN: WHITE MALES

NAVY OCCUPATION GROUP	YEAR	TOTAL IN RLP	% IN GS 5-8	% IN GS 9-12	% IN GS 13-15
(2) ENGINEERS	1972	541332	11.5	33.3	55.2
	1976	622320	12.7	34.3	53.0
	1980	1104193	12.8	38.1	49.1
	1982	1247621	13.3	39.4	47.3
	1990	1420041	16.0	39.1	44.9
(7) PHYSICIANS	1972	53468	*	47.1	52.9
	1976	96050	*	46.8	53.2
	1980	113162	*	43.1	56.9
	1982	112897	*	38.3	61.7
	1990	124928	*	31.6	68.4
(12) PERSONNEL MGRS.	1972	71621	11.7	41.7	46.6
	1976	84786	33.5	32.9	33.6
	1980	205526	4.9	40.4	54.7
	1982	218926	5.1	49.5	45.4
	1990	273603	8.4	59.9	31.7
(13) COMPUTER SPEC.	1972	168294	9.6	62.4	28.0
	1976	232261	14.7	58.0	27.3
	1980	314859	14.8	54.9	30.3
	1982	361078	12.8	60.4	26.8
	1990	431563	8.0	68.9	23.1
(14) MISC. MGRS.	1972	3003793	21.7	47.9	30.4
	1976	3752110	22.7	49.0	28.3
	1980	3729139	23.5	49.4	27.1
	1982	4158423	27.3	49.5	23.2
	1990	4613350	35.9	44.6	19.5

* NOTE; THERE ARE NO PHYSICIANS IN THE G.S. 5-8 LEVEL.

TABLE 7

COMPARISON OF 1980 & 1983 STUDIES OF NATIONAL AVAILABILITY OF SCIENTISTS & ENGINEERS USING RLF MODEL

Methodolgy

1980 Study : 1970 Census using trends through 1979 CPS (R.R#37)

1983 Study : 1980 Census (EEO Special File) using 1972 - 1980 CPS trends (R.R#42)

Related Navy Job Category	Male					Female				
	Total	White	Black	Hisp	Other	Total	White	Black	Hisp	Other
GS 5-8										
1980 Study:										
1978 Act	91.7	82.7	1.5	1.2	6.5	8.1	6.5	1.2	0.0	0.6
1983 Proj	87.0	74.0	2.5	2.0	8.5	13.0	8.0	2.5	1.0	1.5
1983 Study:										
1980 Act	79.1	68.5	3.0	2.4	5.2	20.9	17.2	1.7	0.8	1.2
1988 Proj	80.2	69.4	3.5	3.4	3.9	19.8	16.1	1.6	0.7	1.4
GS 9-12										
1980 Study:										
1978 Act	93.8	85.7	1.4	0.8	5.9	6.2	4.5	1.1	0.3	0.3
1983 Proj	90.2	78.8	2.1	1.9	7.4	9.8	5.5	2.1	1.2	1.0
1983 Study:										
1980 Act	93.8	82.7	2.8	2.9	5.4	6.2	4.4	1.0	0.2	0.6
1988 Proj	93.5	80.7	4.3	3.1	5.4	6.5	4.1	1.2	0.3	0.9
GS 13-15										
1980 Study:										
1978 Act	97.9	89.4	2.1	0.0	6.4	2.1	2.1	0.0	0.0	0.0
1983 Proj	93.0	81.3	2.8	1.0	7.9	7.0	3.3	1.3	1.4	1.0
1983 Study:										
1980 Act	96.7	90.3	1.1	1.5	3.7	3.3	2.9	0.1	0.1	0.2
1988 Proj	95.5	87.8	2.0	2.4	3.2	4.5	3.8	0.2	0.1	0.4

TABLE 8

Extensions

There are many uses for the civilian occupation supply estimates. From a corporate Navy headquarters point of view there are continuing issues of how to best shape staffing policies. The kinds of human resource decisions to be made in the 1980's generally involves more complex ideas using more complex data. The existence of extensive data bases and methodologies has to some extent brought this about. It is becoming clear that key decisions can't be based on intuition. At the same time the end products which are required in shorter reaction times can't be based entirely on scientific analysis. What is needed for human resource planning and control is a set of supply-demand analysis tools which process everything that is cost-effective on a scientific basis with enough flexibility to permit directed judgement and intuition to take place.

The immediate next step of the Navy's reservation wage relevant labor force projections project is to update local level supply and availability projections. This work is being done to include the 65 local Navy labor markets with 250 or more civilian employees. As with the national numbers the base or mean value case is being developed. The results will be published in a forthcoming technical report.

A number of projects are on the horizon which will build upon the 1980 Update NATNUM results. Among these include:

1. Wage Elasticity Analyses. Two kinds of sensitivity studies are needed. The first involves developing high and low estimates of the supply numbers so that scenario analysis can be put into the envelope of the future possibilities. The second involves looking at how the relative attractiveness of Navy wages in relationship to outside employers affects losses from the organization. With the pressure to hold down Federal wages, this latter study appears to be more important as the Navy faces the likelihood of decreasing attractiveness of its wages with increased requirements for persons in the high technology occupations. Both supply and demand (inventory) models are useful in this latter endeavor.

2. Geographic Dispersion. A relocation/wage comparability table can be estimated which would be used as an additional (additive) economic factor on the attractiveness of Navy jobs in selected geographic location. These estimates would be made for both peacetime and mobilization scenarios. Among the outputs can be studies to find out if current mobilization plans are realistic in terms of sharply increased requirements for specific skills in the larger Navy local labor markets.

3. Alternative Force Supply Estimates. This analysis would examine the attractiveness of Navy jobs when self-employment options are possible to be undertaken such as in the physician and computer specialist occupations. The present supply estimating models do not include available persons form the military sector who will be leaving during the projection period. It may be useful to link up with similar reservation wage modeling work on the military sector conducted by the Navy Personnel Research and Development Center (See Atwater and Rowe (1982)).

4. Interactive Decision Support System. The purpose of this decision support system is to provide the supply-demand models in a user friendly environment for manpower analysts. Current modeling support capabilities would be downsized for processing on a minicomputer using menu driven inputs or similar approaches. The tools would be primarily aimed at the headquarters manpower, personnel and training community.

The planning and control of supply-demand relationships is becoming one of the key functions of human resource management. The data on professional employees provided in this paper represent a set of numbers on which to begin to peg the process. The next steps are to bring about the improvements to achieve the desired integration of management judgement with the scientific analysis on which these estimates are based.

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APPENDIX A

MINIMUM EXPERIENCE REQUIREMENTS FOR ENTRY INTO DONOL GRADE GROUPS

OPM Handbook X-118 should be consulted for specific standards. Equivalent experience can be substituted for college degree requirements in many of the occupations.

The minimum experience requirements are summarized for most occupations into four tables. In all cases the education and experience must be in the appropriate areas. Time in grade requirements may also apply.

DONOL Code	Occupational Area	Minimum Requirement
22	Scientists	Table 1
23	Engineers	Table 1
24	Mathematicians	Table 1
30	Accountants	Table 1
3125	Professional Nurse	Table 1 (Diploma program of 30 months or more is fully qualifying for GS-5)
3126	Physician	M.D. degree
3127	Health Professional NEC	Table 1
32	Legal	LL.B or J.D./ pass Bar Exam
33	Education	Table 1
34	Professional NEC	Table 1
40	Financial Management	Table 2
41	Personnel Management	Table 2
42	Procurement	Table 3
43	Logistics	Table 3
44	Quality Assurance	Table 3
45	Computer Specialists	Table 4
46	Intelligence	Table 1 or Table 3
47	Investigators and Examiners	Table 3/Also Ph.D. may be substituted for 3 years specialized experience)
48	Arts and Information	Table 3
49	Manager and Admin. NEC	Table 3

Years of Specialized Experience in Field
in Addition to Degree

Degree	GS 5-8	GS 9-12	GS 13-15
B.S./B.A.	Ø	1	4
M.S./M.A.	Ø	Ø	3
Ph.D.	Ø	Ø	1

Table 1

Experience	GS 5-8	GS 9-12	GS 13-15
Generalized*	1	2	2
Specialized**	2	3	4
Total	3	5	6

* In work related to occupational area other than routine clerical or trades and crafts.

** In field related to occupational area.
B.S./B.A. in appropriate field will qualify for GS 5-7; M.S./M.A. (2 years) in appropriate field will qualify for GS-9; Ph.D. in appropriate field will qualify for GS-11.

Table 2

Experience	GS 5-8	GS 9-12	GS 13-15
General*	3	3	3
Specialized**	Ø	2	3
Total	3	5	6

* In work related to occupational area other than routine clerical.

** In field related to occupational area.
B.S./B.A. in appropriate field will qualify for GS 5-7; one full academic year graduate education may be substituted for one year, specialized experience; two full academic years, (master's degree) graduate education may be substituted for two years specialized experience.

Table 3

Experience	GS 5-8	GS 9-12	GS 13-15
General*	3	3	3
Specialized**	Ø	1	1(2)
Specific***	Ø	1	2(1)
Total	3	5	6

* In work related to occupational area other than routine clerical.
** In work related to computer specialist area.
*** In computer specialist specializations.
Four years undergraduate (B.S./B.A.) may be substituted for three years general experience; one full academic year of graduate education may be substituted for one year specialized experience; two full academic years (Master's Degree) graduate education may be substituted for two years specialized experience.

Table 4

APPENDIX B

NATIONAL LABOR MARKET AVAILABILITY ESTIMATES

	1980	1982	1989	1990
SCIENTISTS	%	%	%	%
WHITE MALE	73.6	70.7	66.8	64.5
BLACK MALE	1.9	2.4	3.8	4.7
HISPANIC MALE	2.1	2.4	3.2	3.8
OTHER MALE	4.2	4.7	5.2	5.5
WHITE FEMALE	14.4	15.2	15.2	15.2
BLACK FEMALE	1.4	1.6	1.9	2.1
HISPANIC FEMALE	.7	.9	.9	1.1
OTHER FEMALE	1.7	2.1	2.9	3.3
ENGINEERS	%	%	%	%
WHITE MALE	87.0	87.1	85.7	84.9
BLACK MALE	1.6	1.7	2.5	2.8
HISPANIC MALE	2.3	2.7	3.1	3.4
OTHER MALE	4.9	4.5	4.4	4.3
WHITE FEMALE	3.4	3.2	3.4	3.6
BLACK FEMALE	.4	.4	.4	.4
HISPANIC FEMALE	.1	.1	.1	.1
OTHER FEMALE	.3	.3	.4	.4
MATHEMATICS	%	%	%	%
WHITE MALE	66.3	67.4	67.4	66.6
BLACK MALE	5.5	5.7	5.8	6.2
HISPANIC MALE	1.9	1.6	1.8	1.9
OTHER MALE	3.1	2.5	2.4	2.4
WHITE FEMALE	17.1	16.5	16.0	16.3
BLACK FEMALE	3.9	3.9	4.0	4.1
HISPANIC FEMALE	.9	.9	.9	.9
OTHER FEMALE	1.3	1.4	1.5	1.6
ACCOUNTANTS	%	%	%	%
WHITE MALE	65.8	60.2	54.5	52.0
BLACK MALE	1.9	2.1	2.4	2.5
HISPANIC MALE	2.4	2.6	3.0	3.3
OTHER MALE	2.4	2.3	2.3	2.3
WHITE FEMALE	20.8	25.8	30.3	32.1
BLACK FEMALE	3.5	3.6	3.7	3.8
HISPANIC FEMALE	1.5	1.4	1.3	1.3
OTHER FEMALE	1.8	2.0	2.6	2.8

NATIONAL LABOR MARKET AVAILABILITY ESTIMATES

	1980	1982	1988	1990
LAWYERS	%	%	%	%
WHITE MALE	74.4	78.5	72.7	70.7
BLACK MALE	2.5	2.3	2.4	2.7
HISPANIC MALE	1.4	1.5	1.2	1.2
OTHER MALE	1.4	1.4	1.0	.9
WHITE FEMALE	17.2	13.6	20.5	22.1
BLACK FEMALE	2.1	1.8	1.5	1.6
HISPANIC FEMALE	.5	.4	.4	.3
OTHER FEMALE	.5	.4	.4	.5
EDUCATORS	%	%	%	%
WHITE MALE	58.1	57.9	58.9	58.7
BLACK MALE	3.5	4.3	4.9	5.3
HISPANIC MALE	2.1	2.2	2.3	2.4
OTHER MALE	2.5	2.6	2.8	2.9
WHITE FEMALE	29.1	28.0	26.3	25.7
BLACK FEMALE	2.6	2.8	2.6	2.7
HISPANIC FEMALE	.8	.8	.8	.8
OTHER FEMALE	1.8	1.4	1.4	1.5
PHYSICIANS	%	%	%	%
WHITE MALE	69.5	67.8	66.5	65.5
BLACK MALE	2.8	3.1	3.5	3.7
HISPANIC MALE	2.5	2.8	3.4	3.8
OTHER MALE	3.4	8.6	8.7	8.8
WHITE FEMALE	10.9	11.0	10.4	10.1
BLACK FEMALE	1.2	1.4	1.3	1.4
HISPANIC FEMALE	1.6	1.8	1.9	2.0
OTHER FEMALE	3.2	3.6	4.3	4.7
NURSES	%	%	%	%
WHITE MALE	4.2	4.0	4.3	4.6
BLACK MALE	1.0	.9	1.0	.9
HISPANIC MALE	.5	.5	.4	.4
OTHER MALE	.4	.4	.4	.4
WHITE FEMALE	79.2	80.9	79.7	78.2
BLACK FEMALE	5.6	5.1	5.7	5.8
HISPANIC FEMALE	2.0	1.8	1.8	2.1
OTHER FEMALE	7.1	6.4	6.7	7.4

NATIONAL LABOR MARKET AVAILABILITY ESTIMATES

	1980	1982	1988	1990
HEALTH PROFESSIONALS	%	%	%	%
WHITE MALE	46.2	44.6	40.1	37.6
BLACK MALE	3.4	3.8	5.5	6.3
HISPANIC MALE	3.2	3.6	3.3	3.4
OTHER MALE	2.2	2.1	2.1	2.2
WHITE FEMALE	37.5	38.1	41.5	42.7
BLACK FEMALE	3.3	3.3	3.0	3.1
HISPANIC FEMALE	1.6	1.7	1.6	1.7
OTHER FEMALE	2.5	2.6	2.9	3.1
MISCELANEOUS PROFESSIONALS	%	%	%	%
WHITE MALE	47.0	47.6	46.7	48.4
BLACK MALE	3.6	3.2	3.2	3.1
HISPANIC MALE	1.5	1.9	2.0	2.1
OTHER MALE	1.2	1.2	1.1	1.1
WHITE FEMALE	36.8	37.1	38.1	35.8
BLACK FEMALE	7.0	6.5	6.5	7.1
HISPANIC FEMALE	1.6	1.3	1.2	1.2
OTHER FEMALE	1.2	1.2	1.3	1.2
FINANCIAL MANAGERS	%	%	%	%
WHITE MALE	69.0	69.0	66.9	65.8
BLACK MALE	4.9	5.1	5.7	5.7
HISPANIC MALE	2.3	2.4	2.7	3.0
OTHER MALE	1.7	1.7	2.1	2.2
WHITE FEMALE	17.8	17.2	17.5	17.8
BLACK FEMALE	2.5	2.5	2.8	3.0
HISPANIC FEMALE	.8	.8	.8	.8
OTHER FEMALE	1.0	1.3	1.5	1.7
PERSONNEL MANAGERS	%	%	%	%
WHITE MALE	55.6	53.8	51.9	50.9
BLACK MALE	5.2	5.3	6.6	6.9
HISPANIC MALE	3.1	3.6	3.9	4.1
OTHER MALE	1.7	1.7	1.6	1.6
WHITE FEMALE	24.4	25.5	25.6	25.3
BLACK FEMALE	4.7	4.7	4.9	5.2
HISPANIC FEMALE	3.6	3.7	3.5	3.6
OTHER FEMALE	1.6	1.7	2.1	2.4

NATIONAL LABOR MARKET AVAILABILITY ESTIMATES

	1980	1982	1988	1990
COMPUTER SPECIALISTS	%	%	%	%
WHITE MALE	67.4	68.5	67.5	67.6
BLACK MALE	2.4	2.5	3.2	3.3
HISPANIC MALE	1.9	2.0	2.3	2.4
OTHER MALE	2.7	2.6	2.7	2.8
WHITE FEMALE	20.9	19.7	18.5	17.9
BLACK FEMALE	2.2	2.2	2.7	2.8
HISPANIC FEMALE	.8	.8	1.0	1.1
OTHER FEMALE	1.7	1.7	2.1	2.0
MISCELLANEOUS MANAGERS	%	%	%	%
WHITE MALE	72.4	73.3	73.7	73.4
BLACK MALE	2.7	2.6	3.0	3.0
HISPANIC MALE	2.1	1.9	1.6	1.6
OTHER MALE	1.4	.9	1.0	1.0
WHITE FEMALE	18.5	18.0	17.2	17.1
BLACK FEMALE	1.8	1.9	2.1	2.3
HISPANIC FEMALE	.6	.6	.7	.8
OTHER FEMALE	.6	.7	.7	.7